



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

TESTING OF CHECK VALVES

BY J. WALTER ACKERMAN

In the year 1908 the water department of the city of Auburn caused an examination to be made of the check valves of the mill and factory connections in the city of Auburn. And as these check valves were of the type that are bought on a competitive basis, and simply represented a design made looking towards an economy of material and labor, the results of this examination can be easily imagined.

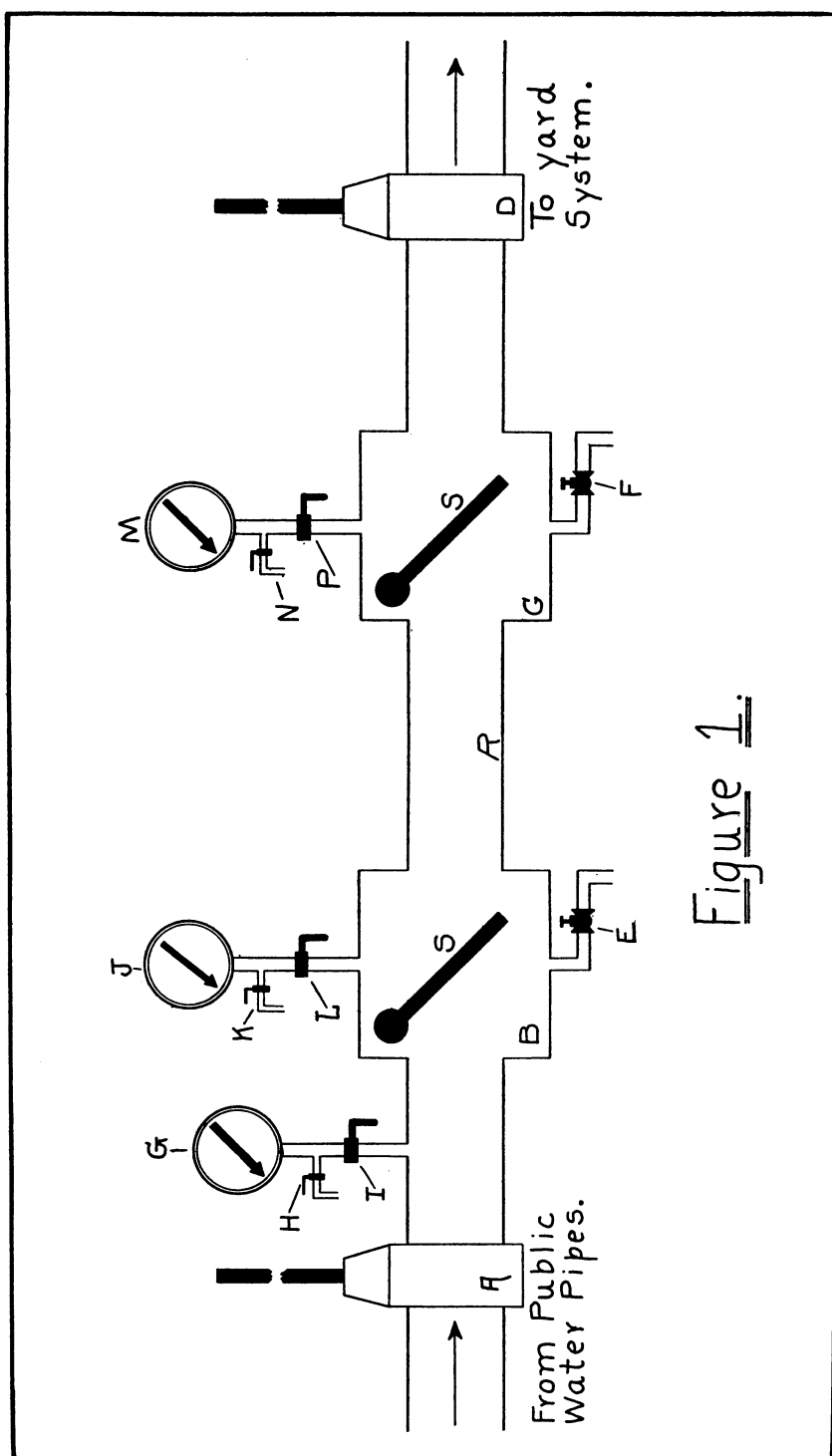
It was found in many cases that even the locations of the valves were unknown to the factory, and some had been buried in the ground for a period of twenty years, without ever having been examined. The final result of this inspection was that each and every mill or factory using city water for fire protection, and having a polluted auxiliary supply, was required to install double check valves of a special design, and to be placed in a brick or concrete vault, accessible at all times to inspection and test.

The specifications under which the check valves were made, require that the seat ring, disc holding ring, and screws, and in fact all moving parts, and the hinge pin and bushings of same be of bronze, the disc to be faced with medium hard rubber, and liberal clearance to be made all around the clapper, the pin, the arm, etc. These specifications were largely determined by the inspection department of the Associated Factory Mutual Fire Insurance Companies of Boston, and they also had to meet with the approval of the water department of the city of Auburn.

The regulations are that they shall be tested once every six months by the water department, and taken apart once each year and examined for defects or obstructions, and during this latter inspection a representative from the Associated Factory Mutual Fire Insurance Company is present to observe the condition of the valve and assist at the test.

It is specified by the water department that the inspection and test shall be at the expense of the factory or mill where the tests are made.

Figure 1 shows a diagrammatic representation of an installation made in the city of Auburn. The stop gate valves *A* and *D* are so



placed in line as to absolutely shut off the water from the check valves. On the entering side, between the first valve *A* and the check valve, is a tap with cock and air vent, on which is placed the pressure gauge *G*. Likewise, two other taps on the two check valves are made with the same type of connection. Tapped into the bottom of each of the check valves is a $\frac{3}{4}$ inch connection, controlled by cocks *E* and *F*.

The actual test is made as follows: Closing gate *A*, either the cock *E* or the air cock *H* is opened. The pressure at *G* only should fall if the check valve *B* is tight and the gate *A* is tight. It sometimes happens that the opening of air cock *H* releases the pressure so slowly that the back pressure on check valve *B* will not seat the clapper *S* in valve *B*, and the gauges both *G* and *J* will fall; while if the $\frac{3}{4}$ inch cock *E* is opened the valve *B* will close tight. This simply gives the degree of sensitiveness of the check valve, and indicates its condition; for if the air cock does not show it absolutely tight, the drip *E* may. This generally shows that the rubber facing on the clapper is either coated with slime, or some small indentations occurring, allow the water to pass back through this valve. The conditions of tests are slightly different, depending upon whether a mill has one connection or two. If it has two connections there is always present the city pressure from the other connection coming back to the two valves; whereas, if there is only one connection there is only the static head, or else the fire pumps in the mill are started, and pressure created in that way. If the flow from *E* or *H* is continuous, it is an indication that there is a leak either through both check valves or through the stop gate *A*. If the pressure with *E* and *H* open drops on *G* only, and not on *J* and *M*, it is the gate *A* leaking; but to make absolutely sure, allow all the gauges to assume the normal pressure, and then suddenly release *F*. If gauges *J* and *G* drop, and *M* does not, and flow continues, then it is an indication that the leak is through *A*, and not through *B* and *G*.

After the condition of gate valve *A* and check valve *B* have been thoroughly determined by the above method, then the opening of air cock *K* or drip *F* will disclose whether there is a leak on check valve *G*. And, as before noted, if it shows a leak with *K* open, and tight with *F* open, it simply does not seat properly under a low differential pressure. And this is important, because the valve is called upon to act when the fire pump raises the pressure above that of the water in the city mains. And there always will be a time when the pressure

on each side is just equalized, and then the pressure on the mill side will begin to build up above that of the city side. And while the test may show from both the drips a tight condition, it will not show a tight condition when only the air cocks are used slowly, allowing the difference in pressure to be gradual.

In order that a number of trials may be made on check valve *B*, pressure should be taken from some source and introduced between the two valves. It is preferable in this case to take the pressure from the main on the mill side between check valve *G* and the mill or factory and allow it to come in through either the drip pipe *F* or some other place, in order to balance the pressure each side of check valve *G*. Then this by-pass connection would furnish water for unlimited trials on check valve *B*, independent of check valve *G*, for any water which leaks through *B* would be replaced by the by-pass connection, which, if it was not there, would soon be exhausted if check valve *G* was tight.

The actual value of the test is obtained after it is completed and the examination made of the interior to show actual conditions, such as tuberculations on the iron body, the smoothness of seat ring, the condition of the rubber facing on clapper, and the manner of the closing of the valve. And while the test is only to show working conditions, the examination shows the way the valves are living up to the requirements imposed upon them.

The rules in our department which control the installation of check valves and kindred appurtenances, are as follows:

No water pipes in any building or premises supplied with water by the city shall be allowed to receive a supply of water from any other source except in case of pipes used exclusively for fire protection that conform to the requirements given below:

No connection of the city mains shall be allowed with pipes having another source of water used for miscellaneous purposes except to a tank open to the air, nor shall such pipes have any physical connection with the pipes used for fire protection.

Between the pipes used exclusively for fire protection and the city mains there shall be two check valves placed between two positive valves and located in an accessible brick or concrete pit, with such valves, gages and connections as may be prescribed by the water board for each installation and for the purpose of testing. The check valve shall be of a type approved by the water board. The check valves shall be kept in working order by the consumer and shall be at all times subject to inspection and test by the superintendent of water works, the cost of such test being borne by the consumer. The pure water pipes that have direct connection with the city supply, before the same have

passed through the aforesaid double check valves, shall be painted BLUE; the pipes used exclusively for fire protection shall be painted RED; and the pipes carrying the impure water and that used for miscellaneous mill purposes but not for drinking shall be painted YELLOW. These different systems of pipes shall not have any physical connection with each other in the mill or factory.

There shall be placed on the discharge main of the fire pump a check valve and positive gate. The latter shall be kept closed and sealed by the superintendent of water works, and opened only in case of fire or for the purpose of occasionally testing the fire system, but notice of such occasional test shall be given to the superintendent of water works, and during the test the positive gate between the fire system and the City main shall be kept closed. During the weekly trials of the pump prescribed by the fire underwriters the water shall be discharged either through the relief valves of the pump or through hose connections from the pump.